PATENT SPECIFICATION 1,113,471

DRAWINGS ATTACHED.

Inventors:—GUY HAMILTON FUIDGE and PHILIP CRAWFORD SUGG.

Date of filing Complete Specification: 26 Oct., 1965.

Application Date: 26 Oct., 1964. No. 43542/64.
(Patent of Addition to No. 847,141 dated 11 Feb., 1959).

Complete Specification Published: 15 May, 1968.

Index at Acceptance:—F4 W46A; F4 S(32AU, 35B).
Int. Cl.:—F 24 c 3/00.

1,113,471

COMPLETE SPECIFICATION.

Gas Fires.

We, THE GAS COUNCIL, a British Body Corporate established by Statute, of 1, Grosvenor Place, London, S.W.1, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to gas fires which heat both by radiation and convection.

A room heater of the type known as a Radiant Convector Gas Fire has been described in which the combustion chamber is sealed from the room and the air for combustion enters through a duct at the base of the appliance and the products of combustion leave through another duct at the upper part of the appliance. These two ducts may pass through the outer wall of the room to finish in what is termed a balanced flue terminal, or they may be connected to a common flue system such as an SE-Duct (Registered Trade Mark).

In such fires, the radiating elements heated by the burner are enclosed within a casing and are visible from the room through a transparent or translucent panel in the front of the casing, the products of combustion of the burner passing upwardly through a heat exchanger over the outside of which air is caused to flow by convection and becomes heated and flows out into the room, the products of combustion passing from the heat exchanger to a flue. In the specification of our prior Patent No. 847,141 there is described and claimed one such arrangement, in which separate passages having spaced apart outlets are provided for the flow of convection air and for the flow of combustion air, the convection air passages communicating at both ends with the room space to be heated and the combustion air passages being in communication at both ends with the flue or other space into which the products of combustion are discharged.

The present invention is concerned with an improvement in or modification of the invention which is the subject of Patent No. 847,141 and has for its object a method of constructing a gas fire which overcomes problems of sealing and safety which are inherent in an appliance of the kind referred to above.

According to the present invention, there is provided a gas fire which heats both by radiation and convection and which comprises a casing containing a gas burner, a radiating element heated by the burner and, above the element, a heat exchanger through the inside of which the hot gases pass upwards, and over the outside of which, air is caused to flow by convection and is heated as it flows, separate passages having separate spaced apart outlets being provided through the casing for the flow of convection air and for the flow of combustion air, the former passage being arranged to communicate at both ends with the space to be heated and the latter passage being arranged to communicate at both ends with the flue or other space into which the burnt gases are discharged, wherein the passage for the combustion air incorporates a room-sealed combustion chamber one wall, or a substantial part of one wall, of which is closed by an openable door having a transparent or translucent panel or panels.

Means is preferably provided by which the door is releasably secured in fluid-tight engagement with the combustion chamber to permit of access thereto, as when igniting the fire.

When installed, the fire may be connected up with the air inlet and combustion pro-

ducts outlet of a balanced flue terminal such as that described in our prior Patent Specification No. 930,248, or to a common flue system such as that described in our prior Patent Specification No. 814,381.

Where the transparent or translucent panel in the door is of glass, a special hazard is presented in that, should an explosion take place within the combustion chamber, the glass would be shattered and projected into the room. This is most likely to occur on ignition and according to a further feature of the invention this possibility is avoided by providing a pilot jet to ignite the main burner which pilot jet is housed, together with the main burner, within the combustion chamber but with a gas control tap for the pilot jet outside the combustion chamber but so positioned, as for example behind an extension of the openable door, so that access thereto is not possible except when the seal has been broken and the door is open. It will be appreciated that by preventing access to the burner for the purpose of ignition except when the door has been opened there is ensured an explosion relief opening in addition to making it unlikely that an explosive mixture could in fact accumulate.

An added measure of safety can be achieved by supplying the gas for the pilot jet through a thermo-electric flame failure device of the complete protection type. The push button for actuating this device is also situated outside the combustion chamber but behind the door so that it cannot be reached unless the door is open.

It is convenient to use a pilot jet of the permanent type and to have the main burner control in the orthodox position at one side of the casing of the heater. In this way positive operation of the heater after initial ignition can be effected without having to open the door.

Since, in the design of a practical balanced flue terminal, such as that described in Patent Specification No. 930,248, it is not possible to achieve perfect balance of the wind effects, provision is made for the effect of wind on the terminal slightly to increase the flow of air through the appliance in order to eliminate any falling off in the combustion efficiency.

In the case of a gas fire containing radiants, any undue increase in air flow through the combustion chamber tends to reduce the temperature of the radiants which would cause a marked fall in radiation, although the overall efficiency may not be significantly reduced. To offset any such cooling of the radiants, such excess air, according to a further feature of the present invention, is channeled in front of the radiants, e.g. by providing perforations in a wall consisting of a metal plate positioned between the case of the radiants and the base of the combustion chamber. This flow of excess air in front of the radiants also has the effect of cooling the glass and minimising condensation on lighting up from cold. It also minimises leakage of products of combustion through the door when the appliance is under wind pressure.

The invention is illustrated by way of example in the drawings accompanying the provisional specification in which:—

Figure 1 is a sectional view of a gas fire in accordance with one embodiment of the invention and showing the door in its closed position,

Figure 2 is a transverse sectional view similar to Figure 1 showing the door closing and opening mechanism with the door in its closed position,

Figure 3 is a view corresponding to part of Figure 2 showing the door in its open position,

Figure 4 is a plan view, and in the accompanying drawings in which:—

Figure 5 is a sectional view showing a modified embodiment, and

Figure 6 is a front elevation corresponding in part to Figure 5.

In the drawings F indicates a heating assembly consisting of a fire brick back F1, radiant elements F2 and a burner F3 from which the products of combustion pass through a heat exchange device D similar to that described in British Patent Specification No. 920,606.

The inlet for combustion air is indicated at C and the outlet for the products of combustion at P.

In the gas fire of this invention, the combustion chamber is completely sealed from the room space and for this purpose is in the form of an inner casing 1 which may be formed as a single stamping and comprises a bottom plate 2, a back wall 3, side walls 4 and an inclined upper wall 5.

The inner casing 1 is built into the main or outer casing of the gas fire, which may be in the form of a rectangular box of suitable design being mounted on legs 7. The main or outer casing includes a back wall 8 and a front wall 9 having a front opening 10 to the rear of which the inner casing 1 housing the fire unit F is located.

The front of the inner casing 1, which is formed with a rectangular opening 13, is closed by a door consisting of an inner frame 11 and an outer frame 18. The inner door frame 11 is in the form of a rectangular surround made up of two components 12, 12^1, defining a channel within which is accommodated a glass panel 20 of for example borosilicate heat resistant glass made in sections to minimize thermal stresses. The two components 12, 12^1 may be secured to one another as shown by a

series of bolts 14 which also serve to position and hold a length of asbestos or other heat resistant tape 16, by which the inner door frame 11 is held in sealing engagement with a rectangular flat 15 extending around the opening 13. 17 indicates packing, for example asbestos string material, arranged between the edges of the glass 20 and the metal frame components 12, 12¹.

The inner door frame 11 is carried by the outer door indicated generally at 18, the latter being hingedly attached along its lower horizontal edge, via a hinge rod 21, to the main or outer casing so that the door, as a whole, including the inner door frame 11 and its glass panel 20, can be swung forwardly from its closed position as shown in Figures 1 and 2 to an open position as shown in Figure 3.

The opening movement of the door is limited by means of a pair of links 22, 23 which are pivotally inter-connected with one another and, at their outer ends, are hingedly connected respectively to a pin 24 on the outer door frame 18 and a second pin 26 on the main or outer casing. The support linkage 22, 23 may be arranged on one or both sides of the door.

In order to hold the inner door frame 11 in tight sealing engagement with the seating surface 15, there are provided locking means comprising latch arms 30 in which are cut-outs 31 for co-operation with lugs 32 on the sides of the door surround.

The pivots for the arms 30 are provided by eccentrics 33 fast on a spindle 34 which is rotatably carried in bearings (not shown), the spindle at one end being fitted with, or bearing adapted to receive, a lever, or a key, or a knurled knob 34¹ so that the spindle can be operated from a position which is external of the main casing. Turning of the spindle 34 through 180° is effective, via the eccentrics 33, to cause endwise displacement of the latch arms 30, the purpose of which is to pull the door frame inwardly in the direction of the arrow *x* and thus apply pressure to the sealing tape 16. The locking means are so designed that turning of the spindle 34 in the opposite direction not only releases the pressure from the seal but also releases the latch arms 30 from the lugs 32 to permit the door to be opened. To ensure accurate sealing around the door the door hinges are designed to allow some free movement of the hinge rod 21 thus ensuring that pressure exerted by the latch arms 30 is applied uniformly to the seal. For this reason also, the door frame is so constructed that its sides are flanged to some depth so that they are resistant to bending. Furthermore the flanges are not joined at the corners which permits a degree of torsional movement of the frame.

Convection air is admitted through a series of openings 35 in the bottom of the casing from whence it passes upwardly behind the rear wall 3 of the inner casing 1 and then circulates around the heat exchange device D before returning to the room space through discharge outlets 36 in the top of the casing.

A horizontally disposed wall 36¹ is provided within the inner casing 1 in spaced relationship with the bottom wall 2 of the inner casing 1, this wall serving to provide support for the radiants F2 and the back F1 and being formed with an opening 37 to receive the nipples of the burner F3, or to allow the passage of the flames from the burner therethrough. The wall 36¹ is also formed with a plurality of holes to allow air in excess of that passing through the opening 37 for combustion purposes to pass upwardly between the door and the radiants F2. This flow of air has the effect of cooling the glass panel 20 and minimising condensation on lighting up from cold, and also of minimising leakage of the products of combustion through the door when the appliance is subjected to excessive wind pressure.

In the modified gas fire shown in Figures 5 and 6, the inner casing 1 and the front part D¹ of the heat exchanger D are formed as a single unit instead of being formed as separate parts and bolted to one another as indicated at 5¹ in Figure 1.

As is shown, particularly in Figures 5 and 6, a pilot jet 38 is provided adjacent the burner F3 and within the inner casing 1. A control tap 39 is also provided for the pilot light 38, this tap being connected to the pilot jet by a tube 40 and being arranged outside the combustion chamber 1 but within the outer casing in a position where it can only be operated by opening the door. This arrangement constitutes a safety precaution in that, should an explosion occur, the open door provides an explosion relief opening.

As an added measure of safety, the gas supplying the pilot jet 38 is passed through a flame failure device 41 which is coupled to a gas inlet 42. The flame failure device is also connected, via a tube 43, to a probe 44 arranged adjacent the pilot jet 38, and is arranged so that its push button 45 is outside the combustion chamber 1 but within the main casing so that it is accessible only when the door is open.

The main burner F3, which is also connected to the gas inlet 42 through the flame failure device 41, is controlled by a control knob 46 which is arranged externally of the outer casing in the orthodox position so that, after initial ignition, the gas fire can be controlled in the normal way without the necessity of opening the door. A governor 47 and a pressure testing nipple 48 are also

provided in association with the control knob 46 and the burner F3.

Although the invention has been described with reference to a pair of links for limiting the opening movement of the door, it will be understood that it is not limited in this respect. Thus, a length or lengths of chain could be used in well known manner.

If desired the gas fire of this invention may be used free standing in a normal fire place with the products of combustion discharging into the chimney.

WHAT WE CLAIM IS:—

1. A gas fire which heats both by radiation and convection and which comprises a casing containing a gas burner, a radiating element heated by the burner and, above the element, a heat exchanger through the inside of which the hot gases pass upwards, and over the outside of which, air is caused to flow by convection and is heated as it flows, separate passages having separate spaced apart outlets being provided through the casing for the flow of convection air and for the flow of combustion air, the former passage being arranged to communicate at both ends with the space to be heated and the latter passage being arranged to communicate at both ends with the flue or other space into which the burnt gases are discharged, wherein the passage for the combustion air incorporates a room-sealed combustion chamber one wall, or a substantial part of one wall, of which is closed by an openable door having a transparent or translucent panel or panels.

2. A gas fire as claimed in claim 1, in which the door comprises a surrounding frame supporting a glass panel which frame is hingedly secured along one edge to the casing.

3. A gas fire as claimed in claim 2, in which the surrounding frame consists of an inner frame section and an outer frame section, the inner frame being in the form of a pair of components co-operating to define a channel in which the glass is received and the outer frame being hingedly connected along its lower horizontal edge to the casing.

4. A gas fire as claimed in claim 2 or claim 3, including means for effecting fluid-tight engagement between the door and the combustion chamber.

5. A gas fire as claimed in any one of claims 2 to 4 in which means are provided for holding the door in a closed position said means comprising at least one latch arm one end of which is formed with a cut-out, to engage a projection formed on the door and the other end of which is pivotally mounted on an eccentric which is fast on a spindle secured to the combustion chamber wall, whereby rotation of the spindle is effective, via the eccentric, to cause endwise movement of the latch arm.

6. A gas fire as claimed in any one of claims 2 to 5, including stays for limiting the opening movement of the door.

7. A gas fire as claimed in claim 6, in which the stays comprise a pair of links which are pivotally interconnected with one another and, at their free ends, are hingedly connected respectively to the door and the casing.

8. A gas fire as claimed in any one of claims 1 to 7, including a pilot jet arranged within the combustion chamber adjacent the burner and a pilot tap for controlling the supply of gas to the jet, wherein the pilot tap is arranged externally of the combustion chamber but internally of the casing.

9. A gas fire as claimed in claim 8, including a flame failure device operatively associated with the pilot light, the push button at least of said device being arranged so that it is external of the combustion chamber but internal of the casing.

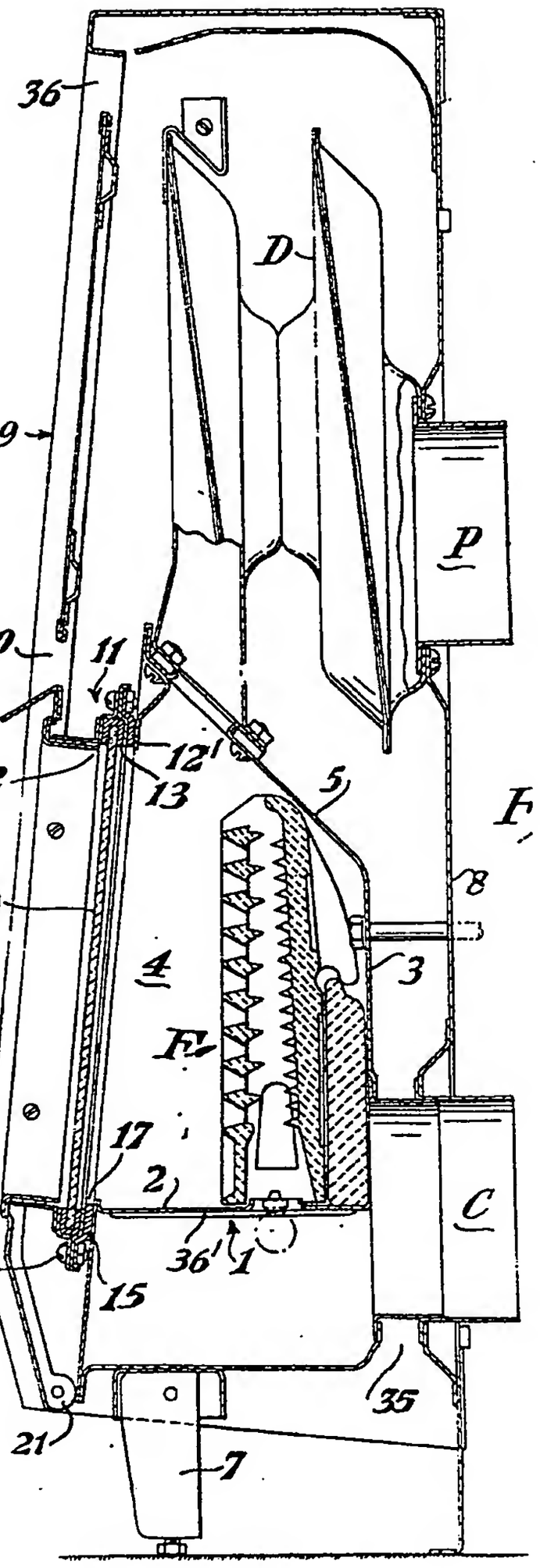
10. A gas fire as claimed in any one of claims 1 to 9, including a horizontally disposed plate or wall arranged within the combustion chamber in spaced relationship with the base of said chamber, the plate or wall being formed with a plurality of holes to allow excess air to flow upwards over the inner surface of the door.

11. A gas fire substantially as hereinbefore described with reference to Figures 1 to 4 of the drawings accompanying the Provisional Specification.

12. A gas fire substantially as hereinbefore described with reference to Figures 5 and 6 of the accompanying drawings.

For the Applicants,
CARPMAELS & RANSFORD,
Chartered Patent Agents,
24, Southampton Buildings,
Chancery Lane,
London, W.C.2.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1968.
Published at The Patent Office, 25 Southampton Buildings, London, W.C.2,
from which copies may be obtained.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1113471 PROVISIONAL SPECIFICATION

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Sheets 1 & 2

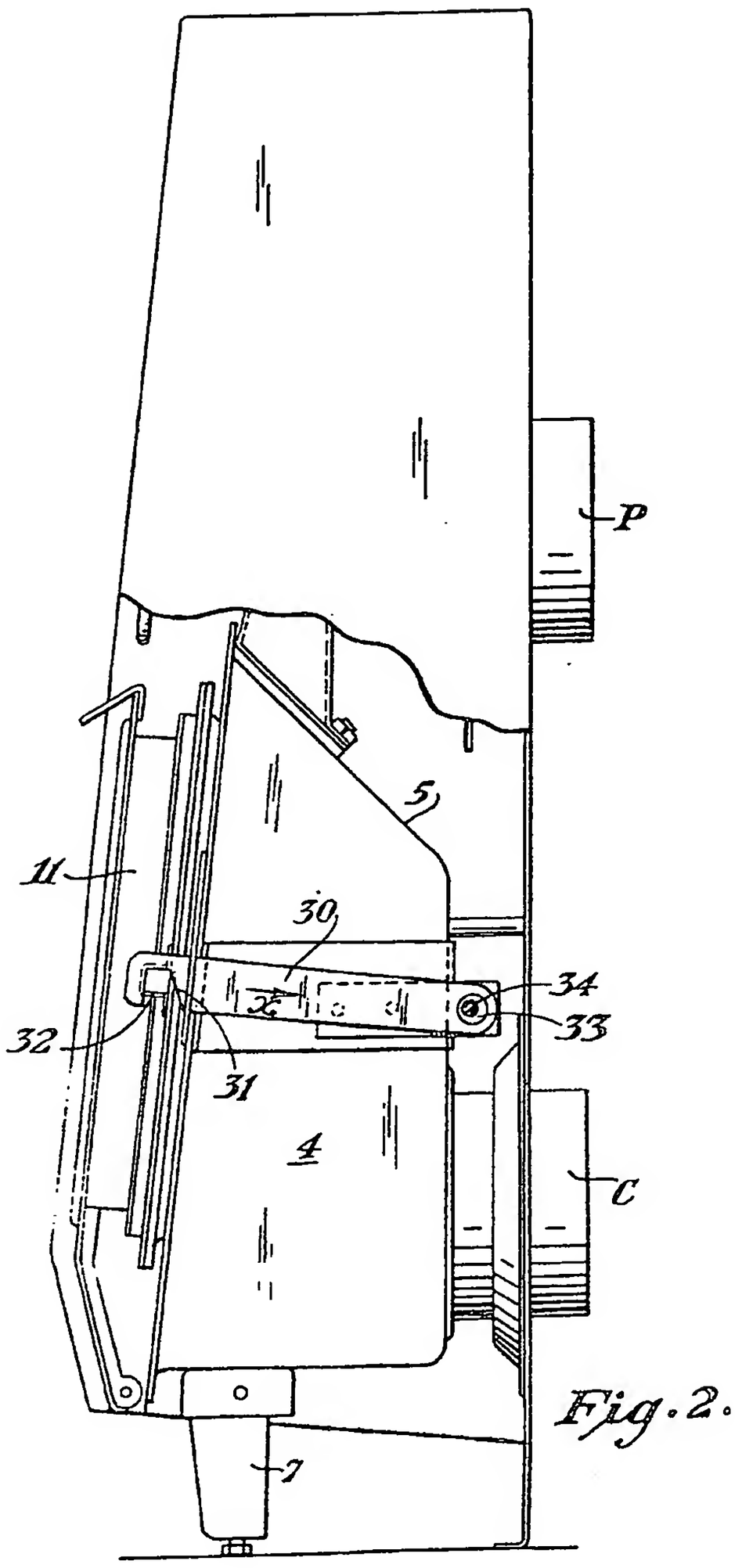

Fig. 2.

Fig. 1.

1113471 PROVISIONAL SPECIFICATION

3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheets 1 & 2

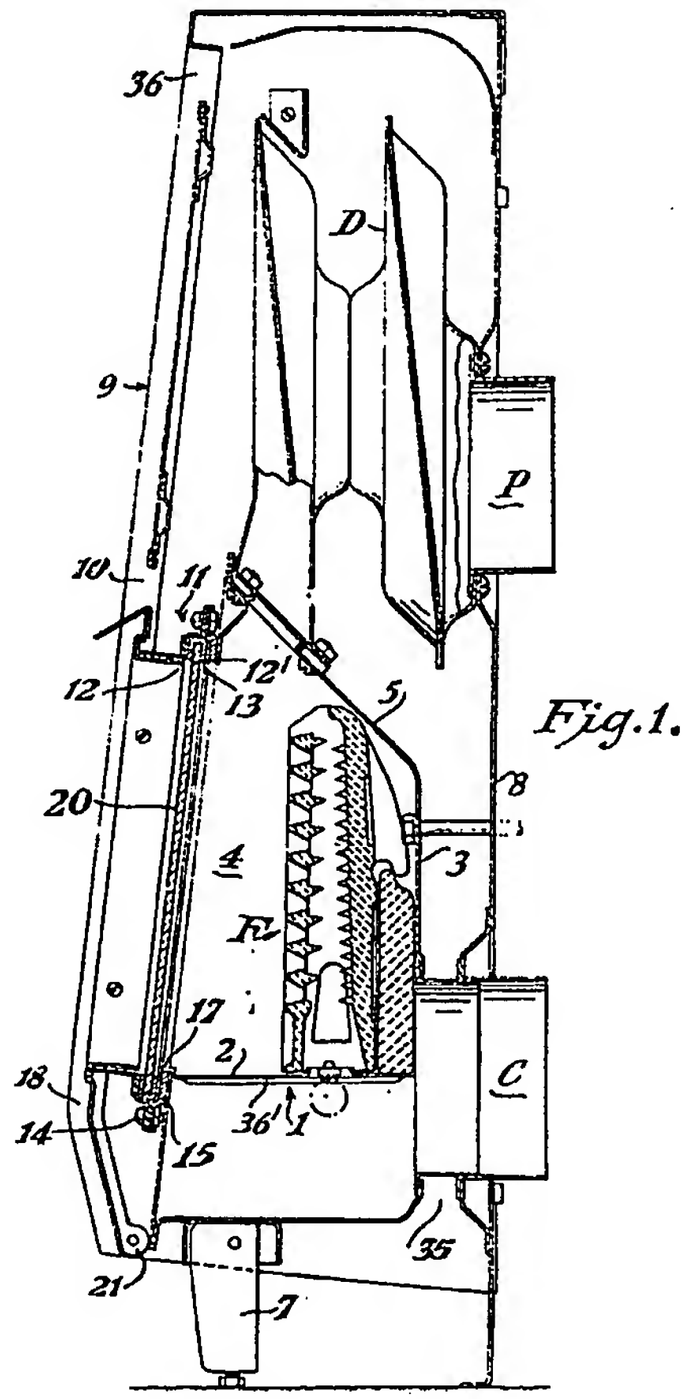

Fig.1.

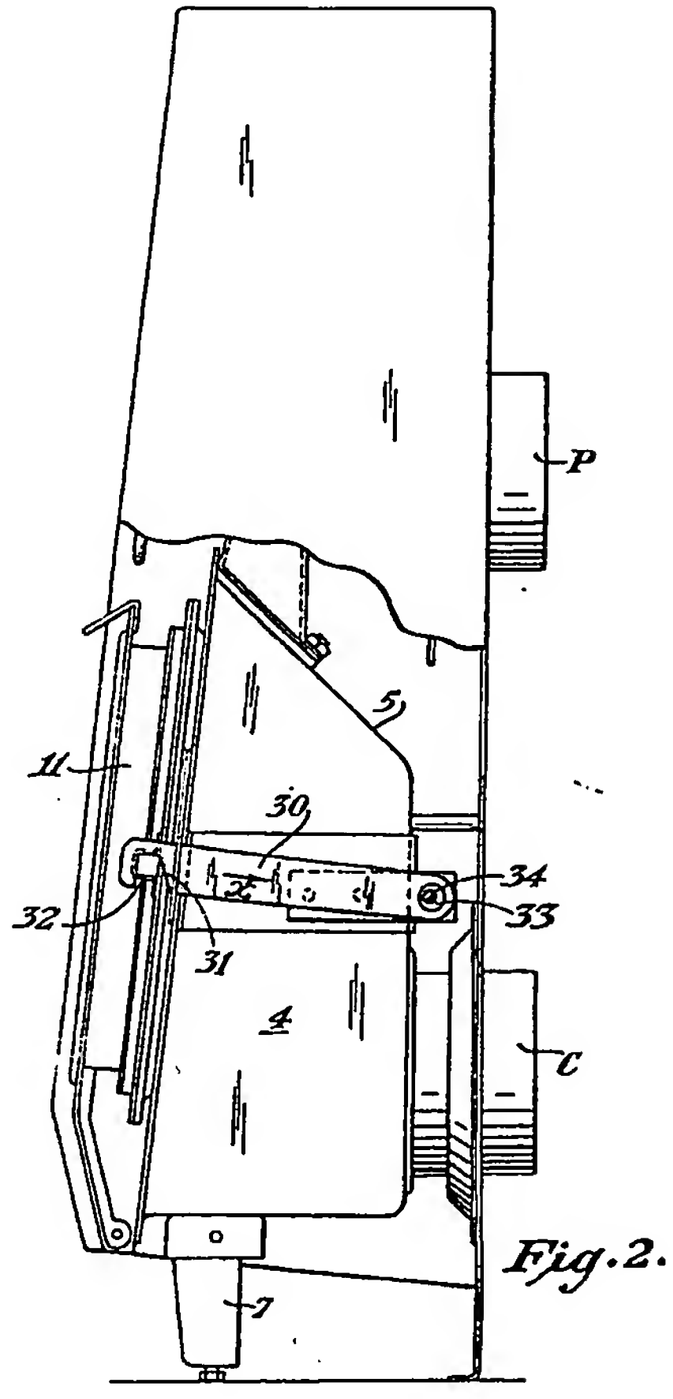

Fig.2.

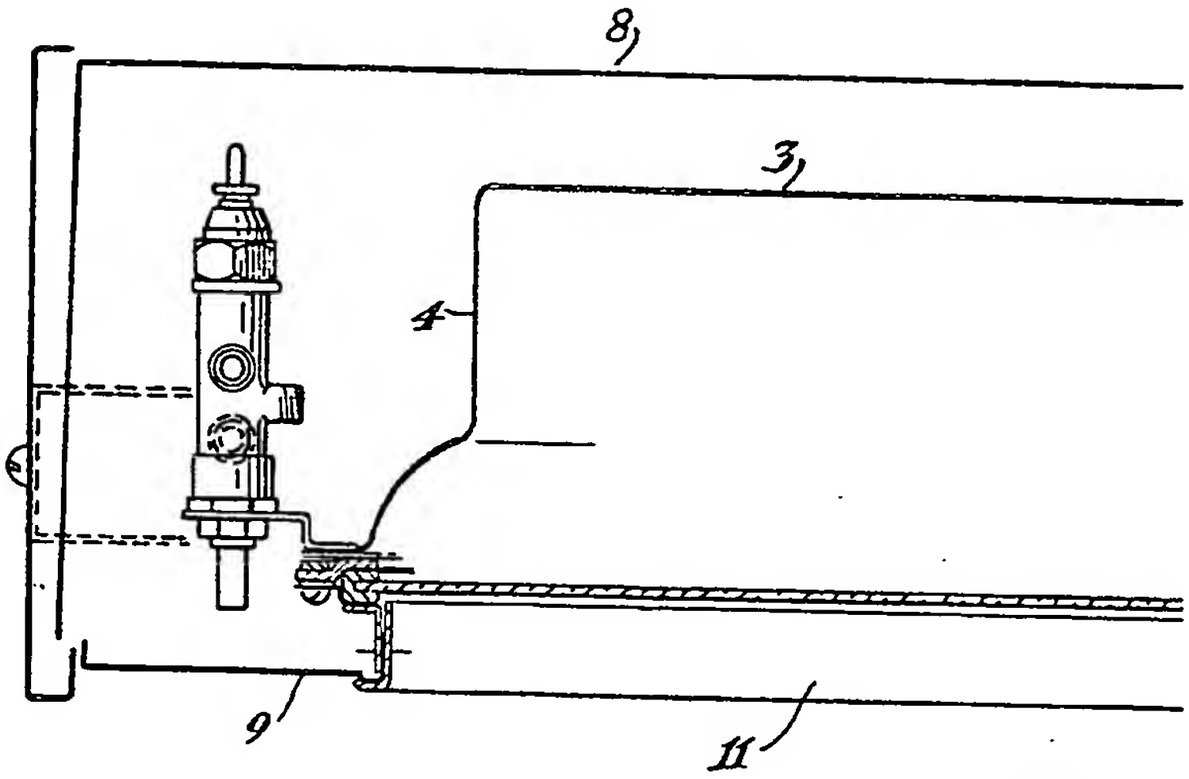

Fig. 4

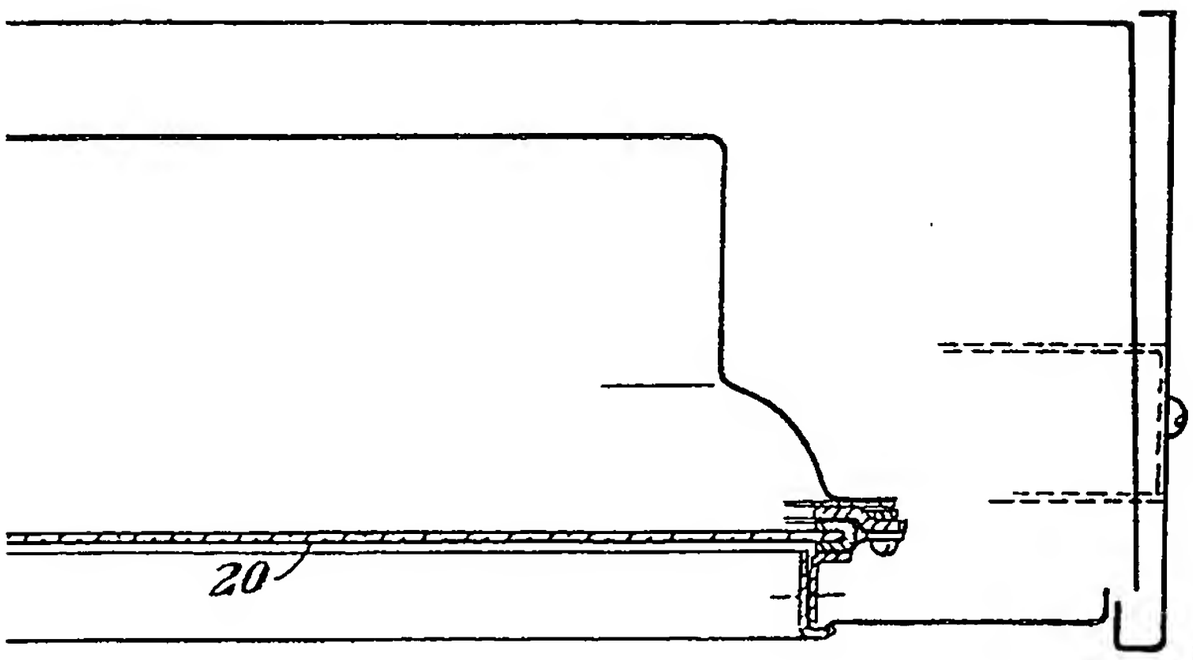

Fig. 4.

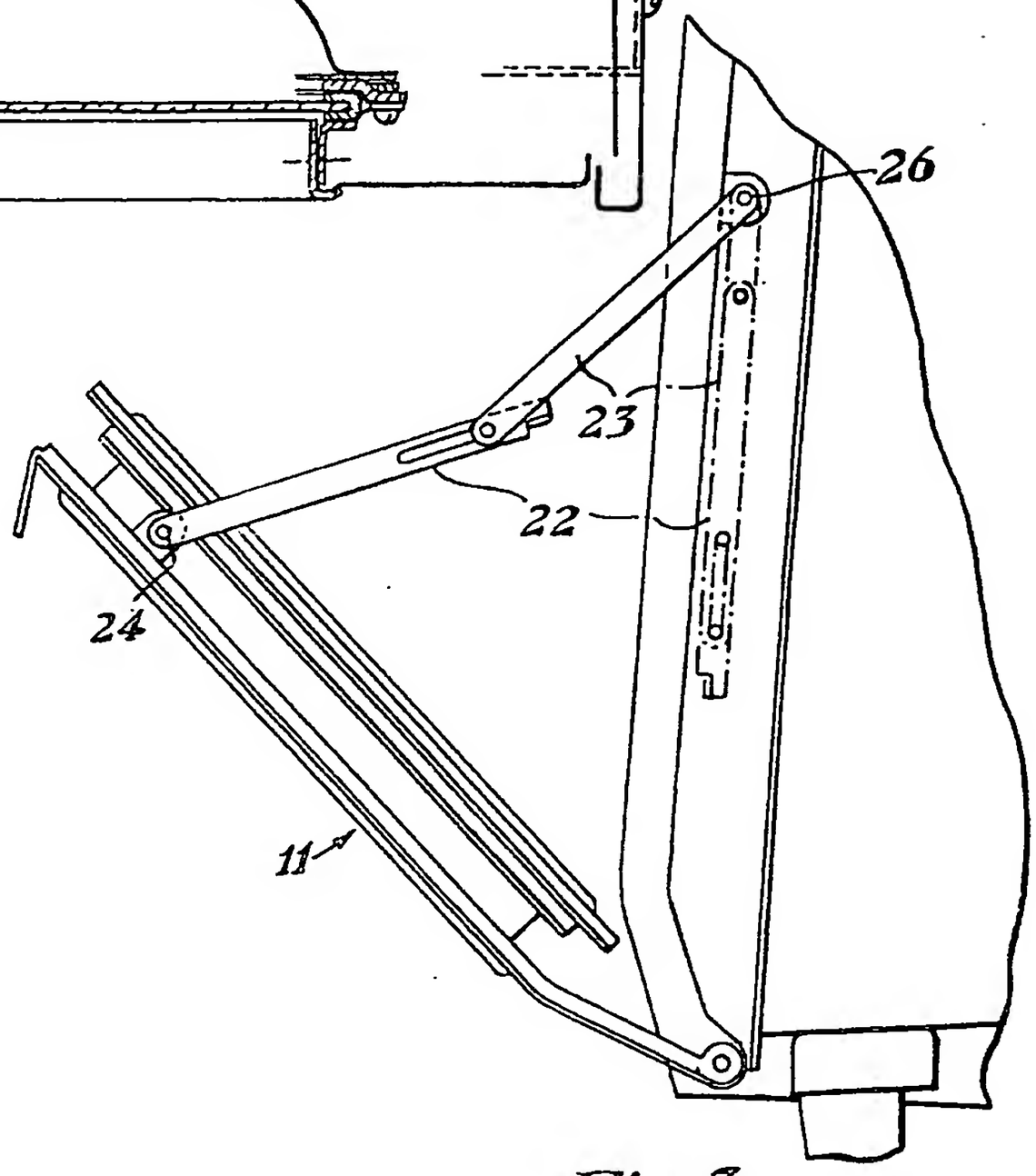

Fig. 3.

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PROVISIONAL SPECIFICATION

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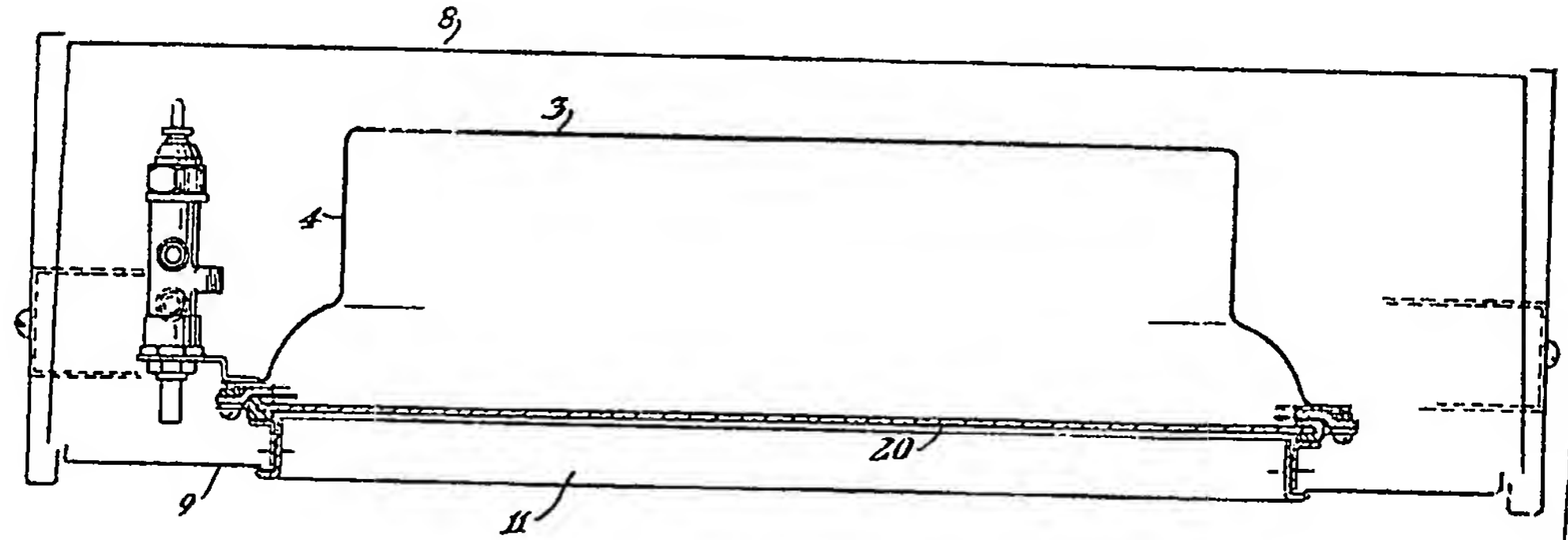

Fig. 4.

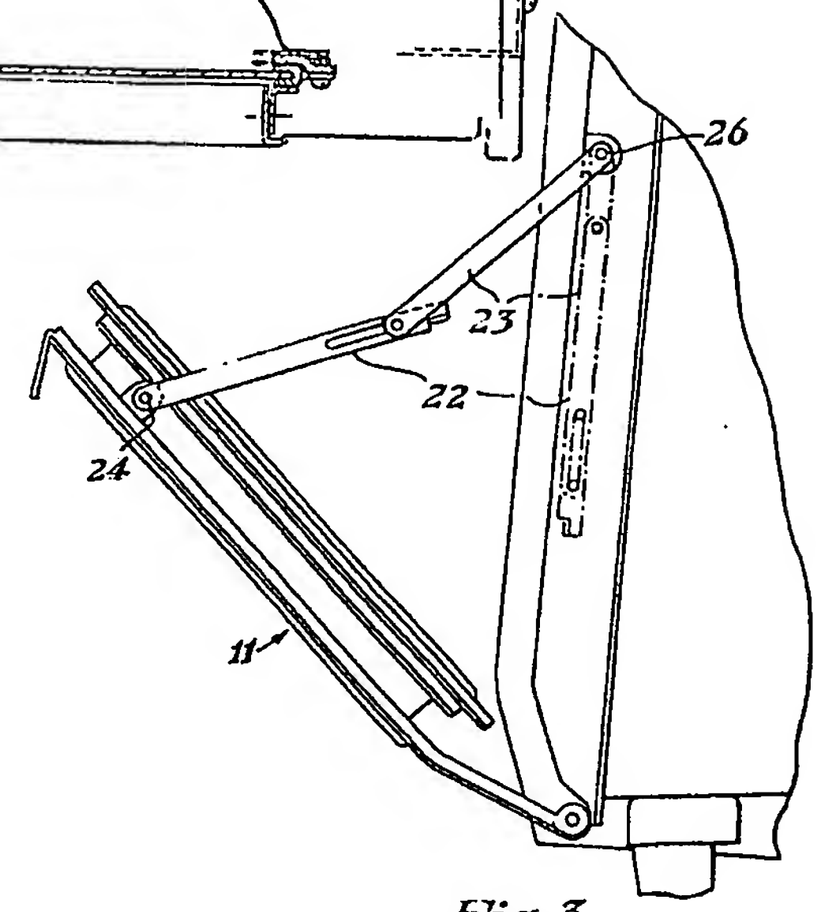

Fig. 3.

1113471 COMPLETE SPECIFICATION

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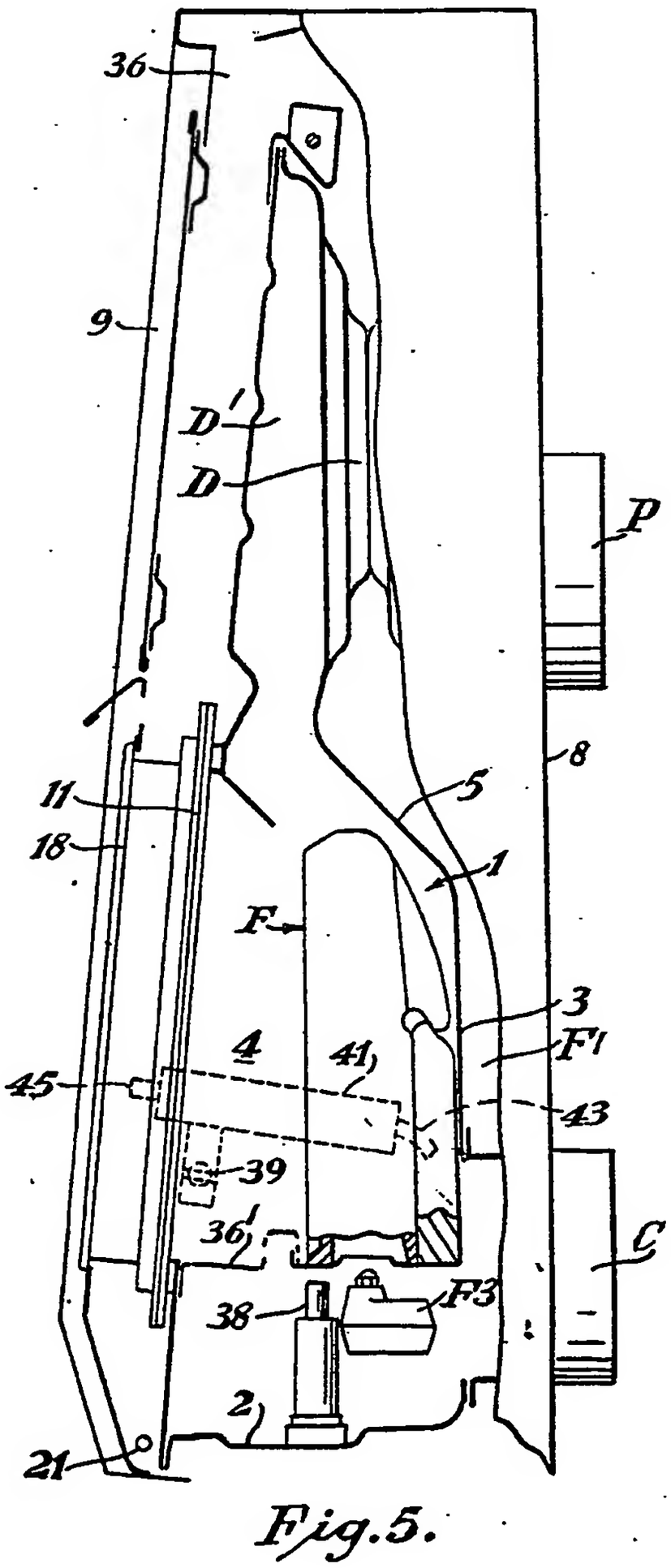
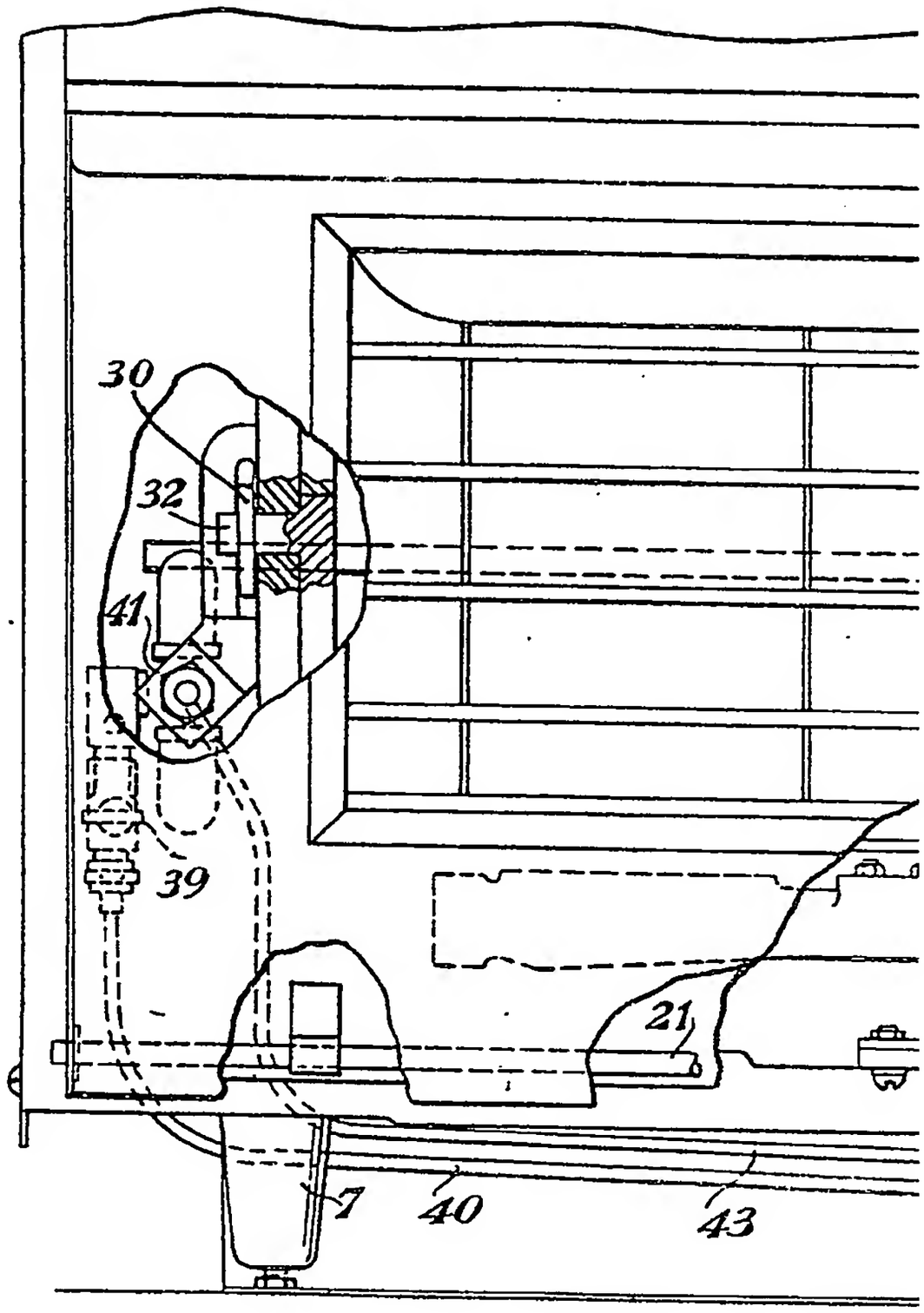


Fig.5.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Sheet 2

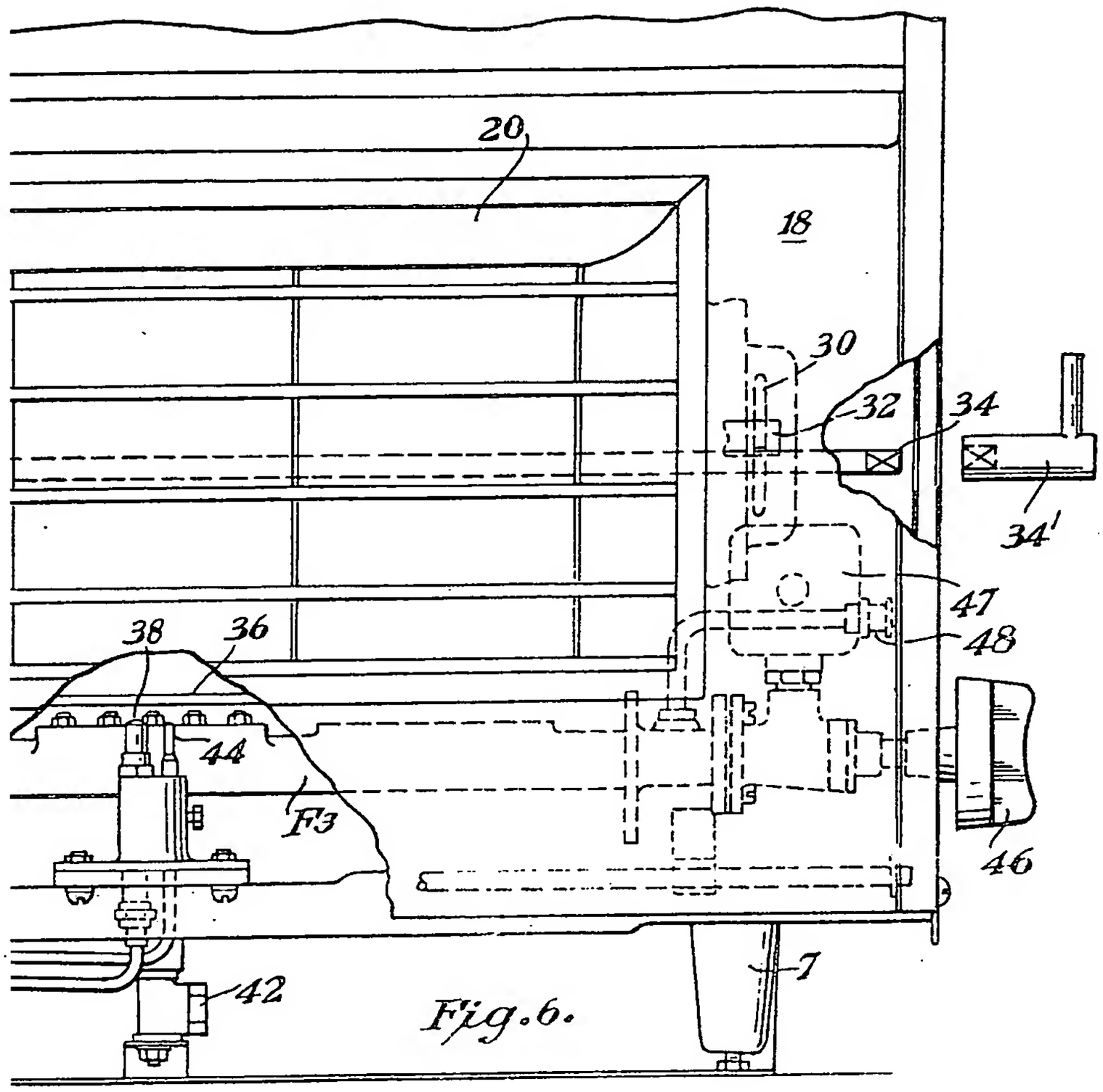

Fig.6.

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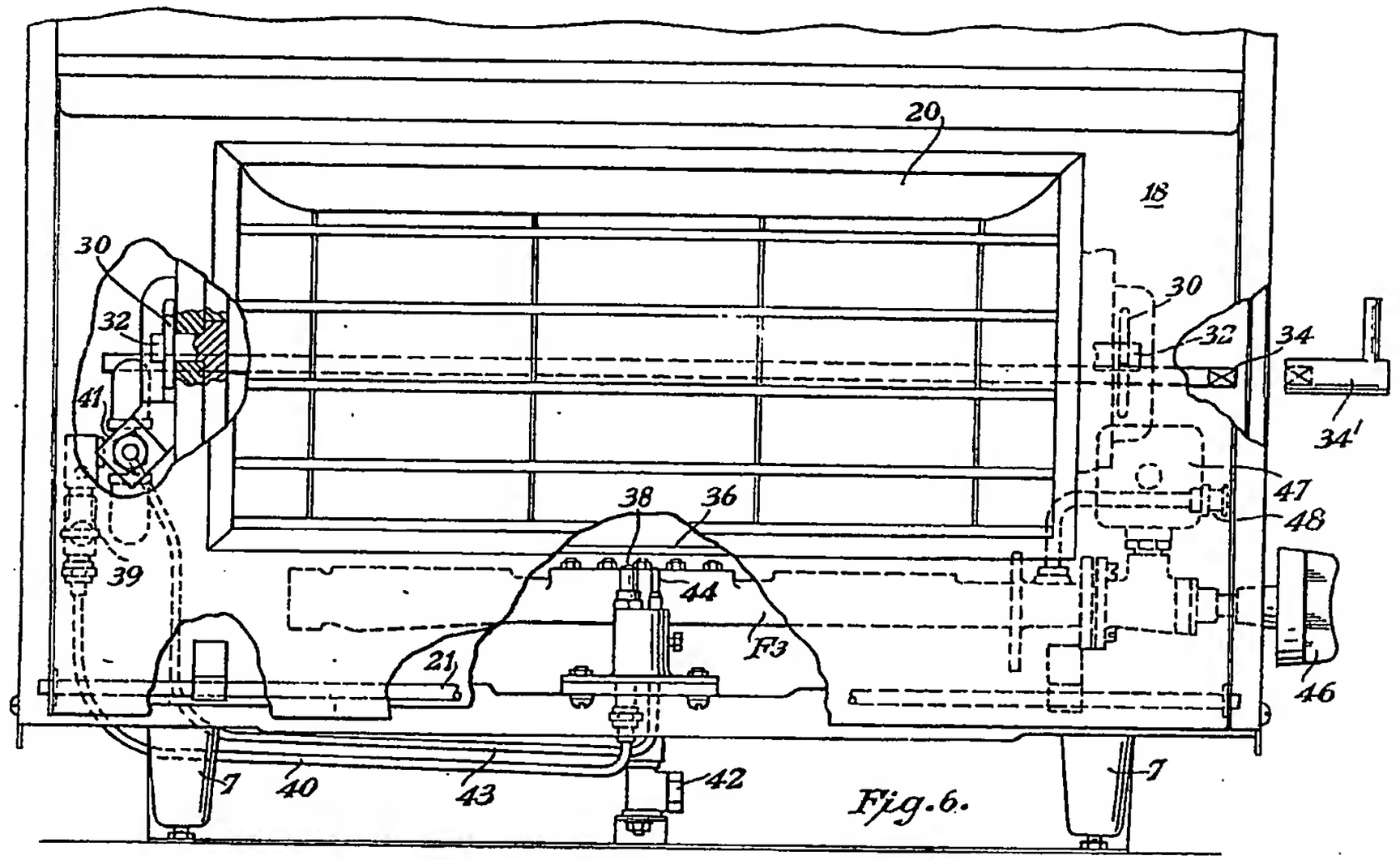

Fig.6.